



Defense Science & Technology
13th Annual
Software Technology Conference
April 30 2001

Deputy Under Secretary of Defense (Science & Technology)

Mission

*... to ensure
that the warfighters
today and tomorrow
have superior and
affordable technology
to support their
missions, and to give
them revolutionary
war-winning
capabilities.*

Office of the Deputy Under Secretary of
Defense for Science and Technology



Defense Science and Technology

A Focus on Revolutionary Advances



Stealth



Adaptive Optics and Lasers



GPS



Night Vision



Phased Array Radar



Predator Unmanned Aerial Vehicle



Tactical surveillance

*Airborne Systems:
138K SLOC
C, PLM*

- Avionics
- Engine control
- Sensors
- Data collection



Predator UAV

Predator Unmanned Aerial Vehicle



*Ground Systems:
487K SLOC
C, PLM*

- Ground control
- Communications
- Data manipulation
- Training simulation
- Mission planning



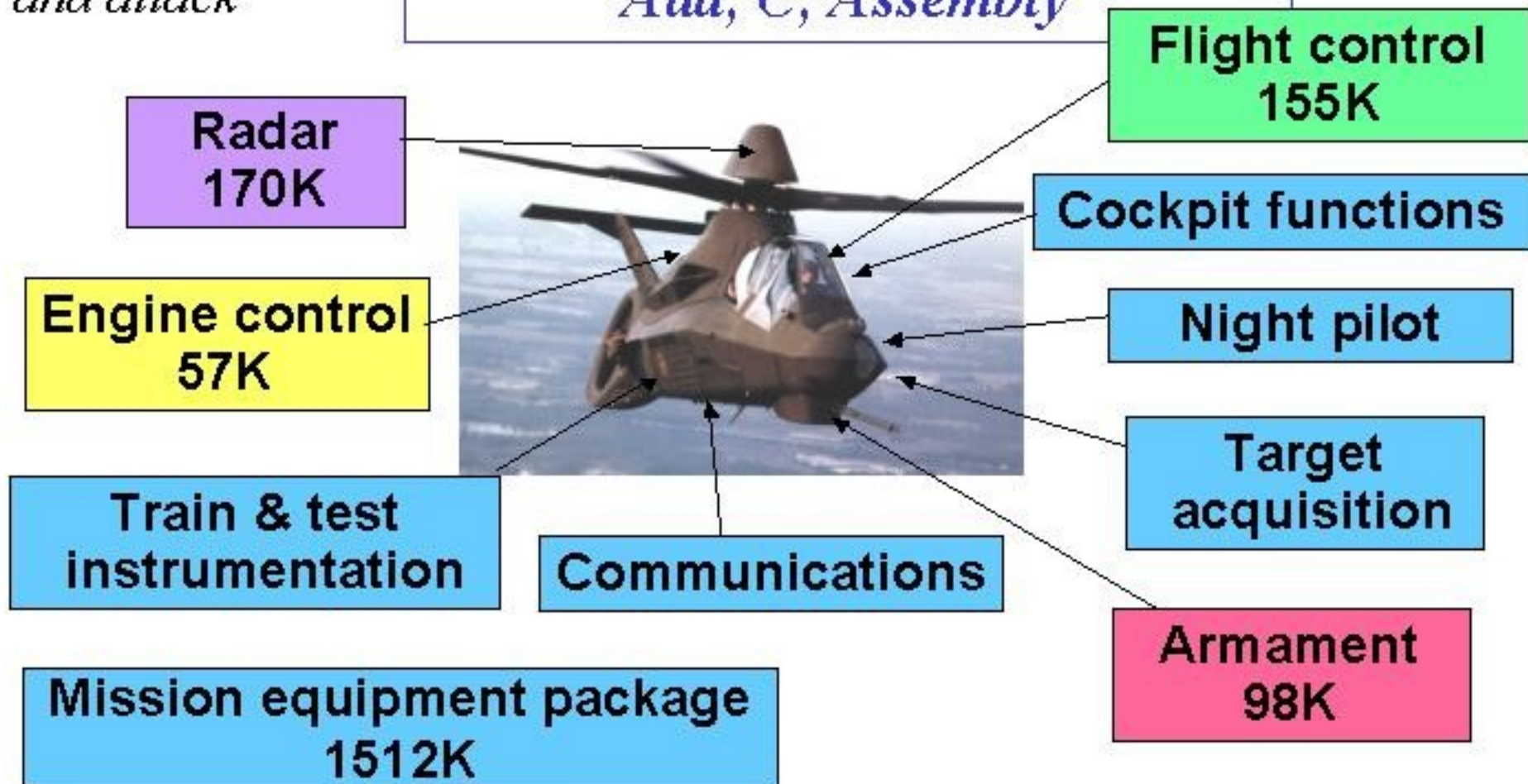
Predator Ground Control Station

Comanche RAH-66



*Reconnaissance
and attack*

*Airborne Systems: 1992K SLOC
Ada, C, Assembly*



Comanche RAH-66



Ground Systems: 1453K SLOC
Ada, C, Assembly

Training	1182K
Support	127K
Integration	144K



Comanche RAH-66

AEGIS Weapon System



*Complete weapon system -
Deployed on destroyers and cruisers*

2,592K SLOC
ADA, C++



Arleigh Burke Destroyer

**Continuous wave
illuminators 15K**

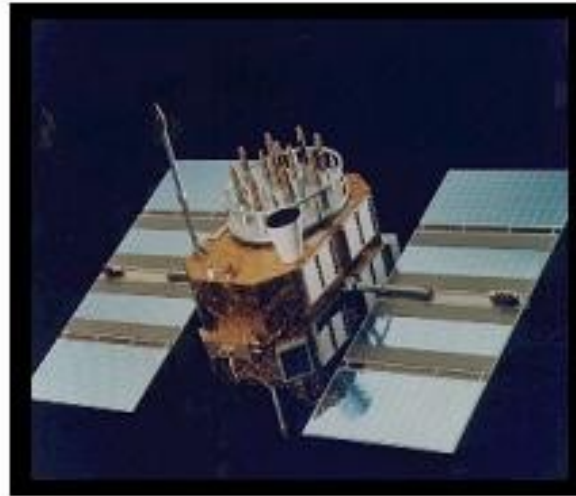
Radar 279K

Display	1200K
Test	385K
Weapon	266K
Training	110K
Command & decision	337K

NAVSTAR Global Positioning System



Communications



Space segment

**Ground antenna
Monitor station
Master control**



Control segment

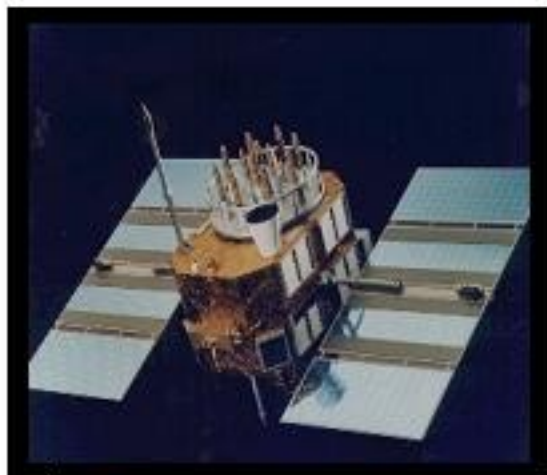


User segment

NAVSTAR Space Segment



Deployed



II/IIA
23 satellites

Deployed:
24K SLOC
per satellite
ADA



IIR
6 satellites

(24 spacecraft required)

Future



IIF

Future:
71K SLOC
per satellite
ADA

NAVSTAR Control Segment



*Deployed:
1800K SLOC
Jovial*

*Future:
1900K SLOC
C++*

- Navigation
- Telemetry
- Tracking
- Orbit analysis
- Scheduling
- Infrastructure



Master control station, Schriever AFB

NAVSTAR User Segment



**Precision lightweight
GPS receiver
100K SLOC**

**Miniaturized
Airborne
GPS receiver
100K SLOC**



***80K-200K SLOC
Jovial***



**Defense advanced
GPS receiver
200K SLOC**

Software is Even in Bullets!



150K SLOC - Weapon
2K SLOC - Ammunition
ADA



OICW Proof of Principle Testing 1999

Infantry Combat Weapon

Wide Area Munition



130K SLOC
Ada, C++, C, Assembly

The DoD is Focused on Software Intensive Systems



In warfighting, software has become the tool of choice.

Software challenges:

- *System complexity*
- *Growing investment (\$\$)*



DoD's Focus on Software Intensive Systems



- USD (AT&L) assigned responsibility for SIS to DUSD(S&T) in March 99.
- **Software Intensive Systems Directorate** established within Information Systems (ODUSD (S&T)).



- DUSD (S&T) established the **Software Intensive Systems Steering Group**
 - Senior software representatives from Services and C3I
- **Defense Software Collaborators** established to:
 - leverage Service, OSD, and FFRDC software experience
 - share ideas, lessons learned, data, and best practices
 - provide cross-service, informed sounding board for SIS

Software Intensive Systems Strategy



- SIS Strategy:
 - Policy
 - Collaboration
 - Education and Training
 - Science and Technology
- SIS activities are focused on recent Defense Science Board Recommendations.



DSB Recommendations-1



Stress Software Process and Past Performance

- Activities:
 - Software Evaluation Policy (Level 3) memo signed by USD(AT&L) in Oct 99.
 - Industry/government Software Evaluation IPT developed policy implementation guidelines. Status to be briefed during OSD track.
 - Transition to integrated Capability Maturity Model (CMMI)
- Next Steps:
 - Publish Software Evaluation Policy guidelines
 - CMMI policy update
 - CMMI technology and Users Group Conference (14-15 Nov 01)



DSB Recommendations-2



Institutionalize Independent Expert Program Reviews (IEPRs)

- Activities:
 - Tri-service Assessment Initiative completed 23 assessments, 4 ongoing
 - USD (AT&L) memo to Service Acquisition Executives Dec 00
 - Endorsed IEPRs for SIS acquisition
 - Chartered Working Group to implement IEPRs into Acquisition Policy
- Next Steps:
 - Policy plan to be presented in June 01
 - Briefing 'lessons learned from assessments' in OSD track



DSB Recommendations-3



Improve Software Skills of Acquisition and Program Management

- Activities:
 - Director, SIS active in establishing requirements for Acquisition Management and Information Technology education
 - SIS Steering Group addressing education and training issues
- Next Steps:
 - SIS Steering Group/Services establish software education priorities



DSB Recommendations-4



Collect, Disseminate and Employ Best Practices

- Activities:
 - SIS and ASD(C3I) chair IPT to develop core set of software metrics for DoD
 - SIS sponsors Practical Systems and Software Measurement Program
 - SEI evaluating current and promising Best Practices
- Next Steps:
 - Define and implement core software metrics throughout DoD.
 - For Best Practices, to determine:
 - Barriers to adoption
 - Strategies for wider deployment



DSB Recommendations-5



Restructure Contract Incentives

- Activities:
 - Contracting Issues Group (59 reps from government, industry, and academia)
- Next Steps:
 - Contracting options and contract language



DSB Recommendations-6



Strengthen the Technology Base

- Activities:
 - ACTD demonstrations of promising software engineering technologies for FY 2002
 - DARPA addressing embedded software challenges
 - Software research focus added to OSD Multidisciplinary University Research program (MURI)
 - Assured Development Technology for High-Confidence Embedded Systems
 - Heterogeneous Distributed Computing Systems
 - Assuring Software Quality



DSB Recommendations-6 (continued)



Strengthen the Technology Base

- Activities (continued):
 - Using CeBASE techniques to evaluate effectiveness and maturity of software technology demos for DARPA's Dynamic Assembly for Systems' Adaptability, Dependability and Assurance Program
 - Pilot project to transition Experience Factory technology to DoD
- Next Steps:
 - Conduct demonstrations to measure benefits of software engineering technologies



A Focus on Tomorrow's Possibilities



Technical Superiority is
Critical for National Security.

In peace, it provides deterrence;

In crisis, it provides options;

In war, it provides an edge."

Defense Science and Technology Strategy
May 2000

